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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/052,309	01/17/2002	Masashi Ito	20911-06648	8387

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EXAMINER	
HARPER, V PAUL	
ART UNIT	**PAPER NUMBER**
2654	

DATE MAILED: 03/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/052,309	ITO ET AL.
	Examiner	**Art Unit**
	V. Paul Harper	2654

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 January 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 17-28* is/are rejected.

7)☒ Claim(s) *13-16 and 29-32* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *03/21/02,06/17/02*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The Examiner has considered the references listed in the Information Disclosure Statements dated 03/21/2002 and 06/17/2002. Copies of the Information Disclosure Statements are attached to this office action.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-8, 11, 12, 17-24, 27, and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Tolonen ("Methods for Separation of Harmonic Sound Sources using Sinusoidal Modeling," AES 106th Convention, May 1999), hereinafter referred to as Tolonen.

Regarding **claim 1**, Tolonen teaches methods for separation of harmonic sound sources using sinusoidal modeling. Tolonen's teachings include the following:

- a unit signal generator for generating one unit signal or plural unit signals, wherein each unit signal has such energy that exists only at a certain frequency, and wherein frequency and amplitude of each unit signal are variable continuously with time (§1.1,

sinusoidal modeling represents a sound as a set of sinusoids [unit signals] parameterized by amplitude, frequency, and phase trajectories);

- an error calculator for calculating an error between spectrum of said input signal and spectrum of the unit signal or spectrum of the sum of the plural unit signals in amplitude/phase space (§2, Iterative Analysis, ¶2, the aim is to select the sinusoid that minimizes the residual [error] signal, Fig. 2);
- altering means for altering said one unit signal or said plural unit signals to minimize said error (§2, ¶3, sinusoid is synthesized and removed for the residual and the recursion is continued unit all the significant components have been removed [minimizing the residual signal]); and
- outting means for outputting said one unit signal or said plural unit signals altered by said altering means as an analysis result for said input signal (Fig. 2, sinusoidal parameters out; also p. 2, §0 Introduction, ¶1, the indicated applications have inherent outputs, e.g., compression coding of audio, etc.; Fig. 11, middle plot is an example output).

Regarding **claim 2**, Tolonen teaches everything claimed, as applied above (see claim 1). In addition, Tolonen teaches "said generator determines the number of unit signals to be generated responsive to the number of local peaks of power spectrum for said input signal" (§2 Iterative Analysis, ¶3, the recursion is continued until all the significant components [peaks] have been detected and remove).

Regarding **claim 3**, Tolonen teaches everything claimed, as applied above (see claim 1). In addition, Tolonen teaches "said one unit signal or each of said plural unit signals includes as its parameters a center frequency of said input signal, a time variation rate of said center frequency, an amplitude of said input signal at said center frequency and a time variation rate of said amplitude" (§1.2, ¶ 2, sinusoidal modeling provides a low level representation of the signal as a collection of sinusoids which include amplitude and frequency variations as a function of time).

Regarding **claim 4**, Tolonen teaches everything claimed, as applied above (see claim 3). In addition, Tolonen teaches "said parameters are modeled by a function" (abstract, §1.2, sinusoidal modeling; p. 6, equation, mid-page, estimated parameters produce an synthesized signal).

Regarding **claim 5**, Tolonen teaches methods for separation of harmonic sound sources in a mixed sound signal using sinusoidal modeling (abstract, Introduction). Tolonen's teachings include the following:

- a frequency analyzer for performing a frequency analysis on said mixed input signal and calculating spectrum and one or more frequency component candidate points at each time (§1.1, ¶1, sound signal is represented as a set of sinusoids the result of an inherent frequency analysis; §1.2, ¶'s 1 and 2; §2 ¶2);
- feature extraction means for extracting feature parameters which are estimated to correspond with said target signal, wherein the feature extraction means comprises a

local layer for analyzing local feature parameters using said spectrum and said frequency component candidate points (§1.2, ¶'s 1 and 2, providing a low level representation [local feature parameters] of the signal as sinusoids), and

- wherein the feature extraction means further comprises one or more global layers for analyzing global feature parameters using said feature parameters from said local layer (§1.2, ¶ 1, determination of grouping that can be used in selecting sinusoids that correspond to a harmonic tone; ¶ 3, a grouping algorithm to form set of the elements corresponding to the events; §2.2, ¶3, parameters are detected across the frames), and;
- signal regenerator for regenerating a waveform of the target signal using said feature parameters extracted by said feature extraction means (§0 Introduction, where the indicated applications have inherent outputs; Figs. 1 and 11).

Regarding **claim 6**, Tolonen teaches everything claimed, as applied above (see claim 5). In addition, Tolonen teaches "said local layer and global layers mutually supply the feature parameters analyzed in each layer to update the feature parameters in each layer based on said supplied feature parameters" (§2.2, ¶'s 2 and 3, interpolated parameter trajectories [in global layer] are used in the iterative parameter selection [in local layer]; and ¶ 1, instantaneous amplitudes and phases [in the local layer] are interpolated between frames [in global layer]).

Regarding **claim 7**, Tolonen teaches everything claimed, as applied above (see claim 6). In addition, "said local layer is an instantaneous encoding layer for calculating frequencies, variations of said frequencies, amplitudes, and variations of said amplitudes for said frequency component candidate points" (§1.2, ¶ 2, sinusoidal modeling provides a low level representation of the signal as a collection of sinusoids which include amplitude and frequency variations as a function of time).

Regarding **claim 8**, Tolonen teaches everything claimed, as applied above (see claim 6). In addition, Tolonen teaches:

- a harmonic calculation layer for grouping the frequency component candidate points having same harmonic structure based on said calculated frequencies and variations of frequencies at said frequency component candidate points and then calculating a fundamental frequency of said harmonic structure, variations of said fundamental frequency, harmonics contained in said harmonic structure, and variations of said harmonics (§1.2, ¶ 1, grouping of sinusoidal components, for instance, pitch analysis results can be used in selecting sinusoids corresponding to a harmonic tone); and
- a pitch continuity calculation layer for calculating a continuity of signal using said fundamental frequency and said variation of the fundamental frequency at each point in time (§2.2, ¶ 2, uses interpolated parameter trajectories; §0 Introduction, application to separation of speech signals, where when voiced speech is being produced there will inherently be a fundamental frequency).

Regarding **claim 11**, Tolonen teaches everything claimed, as applied above (see claim 7). In addition, Tolonen teaches "time variation rates are used as said variations" (§1.2, ¶2, the low level representation of the signal as sinusoids; §2.2., ¶2, the parameters vary in amplitude and frequency as a function of time).

Regarding **claim 12**, Tolonen teaches everything claimed, as applied above (see claim 6). In addition, Tolonen teaches "each of said layers is logically composed of one or more computing elements each computing elements being capable of calculating feature parameters, each computing elements mutually exchanging said calculated feature parameters with other elements included in upper and lower adjacent layers of one layer" (see rejection of claim 6 for mutual exchange of parameters; Fig. 1 is a block diagram indicating some of the computing elements; §2.2 teaches the methods [computing elements] used in the layers).

Regarding **claim 17**, this claim has limitations similar to claim 1 and is rejected for the same reasons.

Regarding **claim 18**, this claim has limitations similar to claim 2 and is rejected for the same reasons.

Regarding **claim 19**, this claim has limitations similar to claim 3 and is rejected for the same reasons.

Regarding **claim 20**, this claim has limitations similar to claim 4 and is rejected for the same reasons.

Regarding **claim 21**, this claim has limitations similar to claim 5 and is rejected for the same reasons.

Regarding **claim 22**, this claim has limitations similar to claim 6 and is rejected for the same reasons.

Regarding **claim 23**, this claim has limitations similar to claim 7 and is rejected for the same reasons.

Regarding **claim 24**, this claim has limitations similar to claim 8 and is rejected for the same reasons.

Regarding **claim 27** this claim has limitations similar to claim 11 and is rejected for the same reasons.

Regarding **claim 28**, this claim has limitations similar to claim 12 and is rejected for the same reasons.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 9, 10, 25, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tolonen in view of Nakatani et al. ("Harmonic sound stream segregation using localization and its application to speech stream segregation," Speech Communication, vol. 27, 1999), hereinafter referred to as Tolonen.

Regarding **claim 9**, Tolonen teaches everything claimed, as applied above (see claim 6). But Tolonen does not specifically teach "said global layer further comprises a sound source direction prediction layer for predicting directions of sound sources for said mixed input signal." However, the examiner contends that this concept was well known in the art, as taught by Nakatani.

In the same field of endeavor, Nakatani teaches sound stream segregation using localization [direction prediction layer] and harmonic structures [global layer] (abstract, §1 Introduction, last paragraph).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Tolonen by specifically providing the features, as taught by Nakatani, because it is well known in the art at the time of

invention that the integration of harmonic structures and sound source direction improves segregation (Nakatani, §1 Introduction, last paragraph).

Regarding **claim 10**, Tolonen in view of Nakatani teaches everything claimed, as applied above (see claim 9). In addition, Tolonen teaches "a pitch continuity calculation layer for calculating a continuity of signals using said fundamental frequency and said variation of the fundamental frequency at points of time" (§2.2, ¶ 2, uses interpolated parameter trajectories; §0 Introduction, application to separation of speech signals, where when a voiced sound is being produced there will inherently be a fundamental frequency). But Tolonen does not specifically teach the following: "harmonic calculation layer for grouping points having same harmonic structure based variations of frequency of said frequency component candidate points as well as the sound source directions predicted by the sound source direction prediction layer, and calculating a fundamental frequency of said harmonic structure, harmonics contained in said harmonic structure, and variation of the frequency component candidate on said frequencies and the fundamental frequency and the harmonics." However, the examiner contends that this concept was well known in the art, as taught by Nakatani.

Nakatani further teaches the use of both a directional [source prediction] and harmonic constraints where the fundamental frequency is extracted (abstract, §'s 3.2 and 3.3).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Tolonen by specifically providing the

features, as taught by Nakatani, because it is well known in the art at the time of invention that the integration of harmonic structures and sound source direction improves segregation (Nakatani, §1 Introduction, last paragraph).

Regarding **claim 25**, this claim has limitations similar to claim 9 and is rejected for the same reasons.

Regarding **claim 26**, this claim has limitations similar to claim 10 and is rejected for the same reasons.

Allowable Subject Matter

4. **Claims 13-16 and 28-32** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claims 13 and 29, it is noted that the closest prior art of record, Tolonen ("Methods for Separation of Harmonic Sound Sources using Sinusoidal Modeling", AES 106th Convention, May 1999) teaches the mutual exchange between global and local parameters, but Tolonen does not teach maximizing a validity indicator that is represented by the product of the first and second consistency functions derived respectively from the upper and lower layers.

Citation of Pertinent Art

5. The following prior art made of record but not relied upon is considered pertinent to the applicant's disclosure:

- Klapuri et al. ("Robust Mulitpitch estimation for the analysis and manipulation of polyphonic musical signals," Proceedings COST-G6 Conference on Digitial Audio Effects, December 7-9, 2000) teach an iterative multipitch separation technique.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to V. Paul Harper whose telephone number is (571) 272-7605. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (571) 272-7602. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

03/24/2005

V. Paul Harper
Patent Examiner
Art Unit 2654

V. Paul Harper